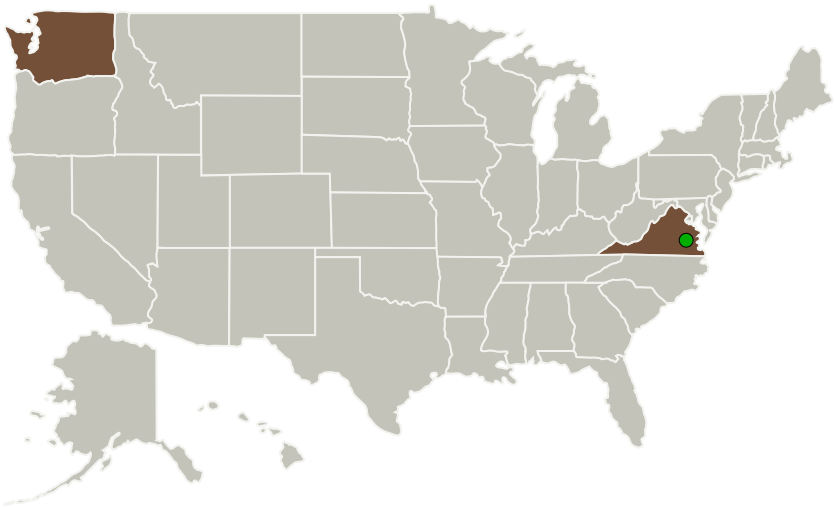
Development of a Plasma Injector for Supersonic Drag Reduction, Phase I

Completed Technology Project (2013 - 2013)

Project Introduction

Methods to reduce the turbulent viscous skin friction stand out as paramount to increasing the energy efficiency, and therefore the aerodynamic efficiency of supersonic aircraft. Eagle Harbor Technology (EHT) proposes to develop and optimize a MHD plasma injector, which will be used to efficiently reduce the viscous skin friction in supersonic aircraft. EHT has developed similar MHD plasma injection technologies, which have been applied to a number of different fusion energy science, aerospace thruster, and basic research investigations. Here, we aim to computationally investigate and verify the dominant physical mechanisms for MHD plasma drag reduction; develop a proof of concept plasma injector demo, which conforms to necessary power and efficiency requirements for an onboard flight-relevant system; and use insights gained through our computational investigations to optimize the performance of our MHD plasma injector for maximum aerodynamic efficiency. This investigation will focus on flight-relevant Reynolds and magnetic Reynolds numbers at low supersonic (M<~3) speeds. Phase II research will couple the plasma injector to a scale model airframe for detailed in-situ supersonic wind tunnel testing. The phase II research will produce a fully realized working plasma injector prototype that conform to power requirements of an on-board power system.

Primary U.S. Work Locations and Key Partners



Development of a Plasma Injector for Supersonic Drag Reduction

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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Eagle Harbor Technologies, Inc.	Lead Organization	Industry Veteran-Owned Small Business (VOSB)	Seattle, Washington
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Virginia	Washington

Project Transitions

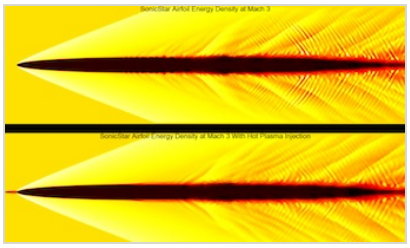
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138092)*

Images



Project Image
Development of a Plasma Injector for Supersonic Drag Reduction *(https://techport.nasa.gov/image/135307)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Eagle Harbor Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

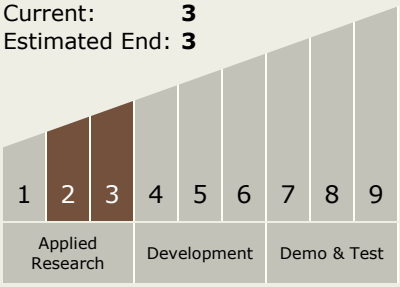
Carlos Torrez

Principal Investigator:

Angus I Macnab

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.1 Aerodynamics

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System